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Euphorbia talassica (*E.* sect. *Esula*, Euphorbiaceae), a new species of leafy spurges from the Western Tian-Shan

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A species of *Euphorbia* sect. *Esula* (Euphorbiaceae) from the Western Tian-Shan, Central Asia, is described as new to science. *Euphorbia talassica sp. nova* occurs in the Talas Mountain Range in Kazakhstan and Kyrgyzstan, and falls into *E.* ser. *Andrachnoides* because of its relatively short and broad leaves. *Euphorbia talassica* is most similar to *E. irgisensis*, from which it differs by having a slender and spreading rootstock (*vs*. a vertical taproot), and incrassate (*vs*. thin) leaves. The new species also grows at much higher elevations. *Euphorbia* ser. *Andrachnoides* is overviewed for Central Asia and adjacent areas, with seven species discussed and mapped.

Introduction

Euphorbia subgen. *Esula* sect. *Esula* (Euphorbiaceae) is one of the most species-rich group of spurges. It includes at least 96 species of perennial herbs or subshrubs with alternate, linear to elliptic (or ovate) leaves and four cyathial glands that are semilunate or trapezoidal, and with two horn-like appendages (Riina *et al.* 2013).

Sixteen species of *E.* sect. *Esula* are placed in the Irano-Turanian floristic element (Geltman 2015), which is characteristic of arid lowlands and mountains of Turkey, Iran, Afghanistan, Central Asia, northwestern China and Mongolia (Takhtajan 1986). Of those, ten species are present in Central Asia (Nasimova 1983).

The taxonomy of *E.* sect. *Esula* in Central Asia was developed by Prokhanov (1949, 1964). Earlier Prokhanov (1933) had described the majority of species in this group. His works (Prokhanov 1933, 1949, 1964) laid a firm basis for further taxonomic studies on *Euphorbia* in Central Asia and the former USSR as a whole.

Prokhanov (1933) examined a specimen (*Kultiasov 18a*) of *E.* sect. *Esula* ser. *Andrachnoides* from the Talas Alatau Mts., which he tentatively included in *E. irgisensis* (as *Tithymalus irgisensis*) but noted the differences in the plant habit and pubescence, as well as in the distribution area. These differences, he assumed, may indicate a species-level distinction which he was not able to confirm due to the paucity of material.

However, in further works Prokhanov (1949) did not mention the presence of any species of *E.* ser. *Andrachnoides* in the Western Tian-Shan.

Later (Gamajunova 1963) such plants were erroneously referred to as *E. tianshanica*, a species of *E.* sect. *Holophyllum*. This section is characterized by typically very broad leaves, and four or five cyathial glands that are elliptic or reniform and lack appendages (Prokhanov 1949, Riina *et al.* 2013). These characters are quite different from those of the plants from the Western Tian-Shan. Besides, *E. tianshanica* is endemic to the area surrounding the western part of lake Ysyk-Köl (Prokhanov 1949), and its occurrence in the Western Tian-Shan is highly unlikely. In spite of this apparent mismatch, *E. tianshanica* (syn. *E. prokhanovii*) was mentioned as being present in the Talas Alatau by Karmyscheva (1973, 1982) and Nasimova (1983).

After discovering a population of this taxon in the Kyrgyz part of the Talas Alatau, and seeing good photographs of the taxon from Kazakhstan, we became convinced that the differences between these plants and *E. irgisensis* are stable and the plants belong to an undescribed species of *E.* ser. *Andrachnoides*.

Material and methods

Field work was conducted in the Western Tian-Shan to complete the information published in the latest checklist of vascular plants of Kyrgyzstan (Lazkov & Sultanova 2014). Taxonomic literature (Prokhanov 1933, 1949, 1964, Baikov 2007, 2009) was examined to determine the relationships of the new species.

The species description follows the standards of Prokhanov (1933, 1949); terminology follows Berry *et al.* (2016). The species distribution was traced from literature (Prokhanov 1933, Karmyscheva 1973) and online resources (www.plantarium.ru). Distribution data on the related species in Central Asia were obtained from floristic and taxonomic literature (e.g. Nasimova 1983, Baikov 2009). Distribution maps were made using the same procedure as in Lazkov and Sennikov (2017).

Toponyms and personal names in the Karakalpak, Kazakh, Kyrgyz and Turkmen languages were transliterated according to the current national Latin scripts. The romanization of the taxonomic authors' names follows the original publications, as advised in Rec. 46B.1 in Turland *et al.* (2018).

Taxonomy

Euphorbia talassica Lazkov & Sennikov, *sp. nova* (*E.* sect. *Esula* ser. *Andrachnoides*; Figs. 1 and 2)

Type: Kyrgyzstan. Talas Range (southern side): near the confluence of Jamgyr and Myrzash Rivers (right tributary of Kara-Kysmak river), on screes among dwarf juniper thickets, 2720 m a.s.l., 42.170603°N, 71.537167°E, 13 June 2018 *G.A. Lazkov* (holotype LE; isotypes FRU, MW). — Other specimens (paratypes), observations and records: Kazakhstan. Aqsý-Jabaǵyly Nature Reserve: Kishi-Qaıyńdy, 18 August 1922 *M.V. Kultiasov 18a* (TASH); Kóksaı (Karmyscheva 1973); Qasqabulaq, 16 July 2017 *V. Kolbintsev* (www.plantarium.ru); Úlken-Qaıyńdy, 18 June 2018 *V. Kolbintsev* (www.plantarium.ru).

Etymology: The species name is derived from the Talas Mountain Range.

Species nova a Euphorbia irgisensi rhizomatibus tenuibus (nec radice verticali), foliis crassioribus, nec non glabritie bene differt. A Euphorbia saurica ovario glabro, cyathii foliis viridibus margine rubescentibus (nec flavescentibus), nec non umbellae terminalis radiis paucioribus (4–6, nec 8–10) dignoscitur.

Perennial herbs 10–25 cm tall, slightly glaucous, nearly glabrous. Rootstock slender, spreading, branched. Caudex slightly branched, with remnants of old stems. Stems erect, a few, slender, not overwintering, glabrous; sterile stems present, not overtopping inflorescence, unbranched; fertile stems with flowering branches in upper third or half, with or without short sterile branches in lower half. Leaves alternate, incrassate, stipules absent; leaves on sterile stems narrowly oblong or oblong-obovate, 1.5–2 × 0.4–0.6 cm, petioles 1–1.2 mm long; leaves on fertile stems elliptical, slightly ovate or obovate, or oblong-obovate, broadest at middle part, 0.8–2 × 0.4–0.9 cm, glabrous or with a few hairs at base, uninervous below, petioles less than 1 mm long. Inflorescence a terminal pseu-

Fig. 1. *Euphorbia talassica* in Kyrgyzstan.

dumbel, with a few to several lateral branches below; terminal pleiochasial branches dichotomous, usually 4–6; pleiochasial bracts 5, ovate or subrotund to oblong-ovate, 0.8–1.5 × 0.5–0.8 cm; dichasial bracts 2, broadly triangular-ovate, green with reddish margins. Cyathium ca. 2 mm long; involucre lobes rounded, ciliate on margins; cyathial glands 4, yellowish, appendages crescent-shaped, 2-horned, horns long and thin. Styles 2–3 mm long, half-fused, slightly bifid. Ovary 2–3 mm long, with 3 vertical furrows, tuberculate, glabrous. Mature fruits not seen. Flowering in June–July.

Distribution and habitat. Western Tian-Shan: Talas Range in Kazakhstan and Kyrgyzstan (Figs. 3 and 4). On screes in the middle mountain belt, at elevations of 2150–3200 m a.s.l., often among dwarf juniper thickets. We do not evaluate the protection status because of absence of population data. All known localities of *E. talassica* in Kazakhstan are within the Aqsý-Jabaǵyly Nature Reserve. The locality in Kyrgyzstan is not protected.

Discussion

Euphorbia talassica is classified in *E.* ser. *Andrachnoides* because of its relatively short and broad leaves, in agreement with the provisional identification by Prokhanov (1933). The leaf characters strikingly distinguish this species from *E. jaxartica*, the only sympatric species of the same section which was treated as belonging to *E.* ser. *Virgatae* (Prokhanov 1964). Phylogenetic analyses (Riina *et al.* 2013, Pahlevani *et al.* 2017) do not support separation of *E.* ser. *Virgatae* (leaves long and very narrow) from *E.* ser. *Esulae* (leaves long but broader), into which the former series should be included. On the other hand, the only species sampled from *E.* ser. *Andrachnoides*, *E. buhsei,* seems to be significantly different from the core of the section in both analyses.

Baikov (2007) suggested that *E.* ser. *Andrachnoides*, as circumscribed by Prokhanov (1964), may be polyphyletic and its xerophytic, broad-leaved species may have resulted from parallel adaptations of different mesophytic, narrow-leaved species to arid conditions. That hypothesis cannot be confirmed or rejected because the monophyly of *E.* ser. *Andrachnoides* has not been tested; nevertheless, we consider it unlikely that *E. talassica* is derived directly from *E. jaxartica*. *Euphorbia jaxartica* has a strong vertical taproot with an abundantly branched caudex, typical of *E. virgata s. lato* (Prokhanov 1933), whereas *E. talassica* develops a very slender, spreading rootstock.

Fig. 2. Holotype of *Euphorbia talassica*.

As a rule, the species of *E.* ser. *Andrachnoides* in Central Asia and adjacent areas have relatively narrow distributions and a high level of geographical separation (Prokhanov 1949, Nasimova 1983, Baikov 2007, 2009). They are largely confined to arid areas. With the new species described here, seven species of the group are known from this territory (Fig. 4). Their diagnostic characters are listed in Table 1 and briefly discussed below.

Euphorbia buhsei stands apart from the other species because of its subshrubby habit with highly lignified stems. It is distributed in extensive areas in Iran and adjacent Turkmenistan (Rechinger & Schiman-Czeika 1964, Nasimova 1983, Nikitin & Geldykhanov 1988, Pahlevani *et al.* 2017), with isolated localities in eastern Turkmenistan (Pojarkova 1950) and adjacent Uzbekistan (Pazij 1959). Its only record from Afghanistan (Rechinger & Schiman-Czeika 1964) was based on misidentification (Pahlevani *et al.* 2017), and its occurrence in Uzbekistan and adjacent parts of Turkmenistan was considered doubtful (Pahlevani *et al.* 2017) but without evidence. There are data on this species from China (Xinjiang) and Mongolia (Govaerts *et al.* 2000, and http://wcsp.science.kew.org/namedetail.do?name_id=78745), which disagree with

Fig. 3. Distribution of *Euphorbia talassica*. Localities in Kazakhstan are based on Prokhanov (1933), Karmyscheva (1973), and www.plantarium.ru.

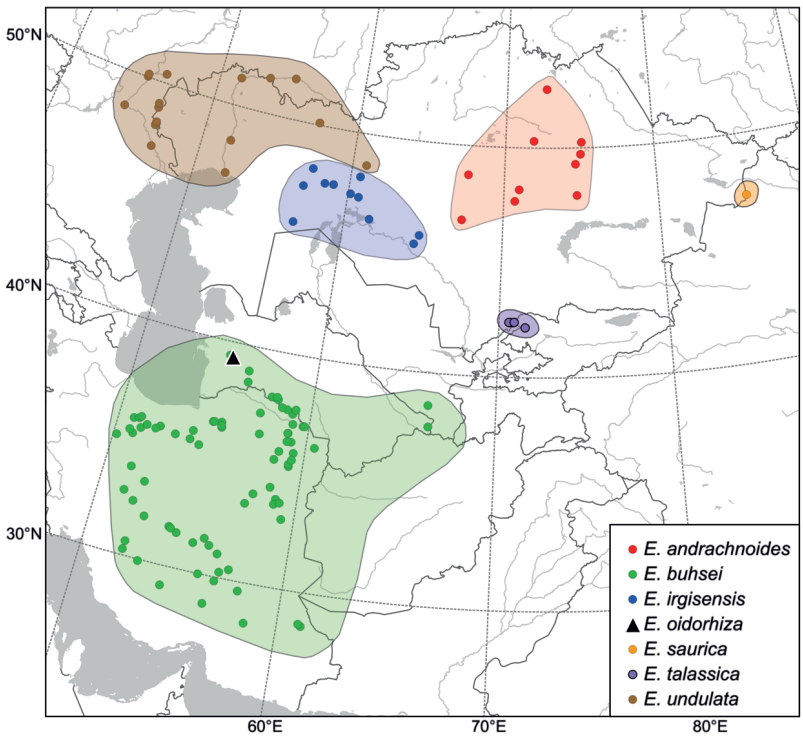

Fig. 4. Distribution areas of central Asian species of *Euphorbia* ser. *Andrachnoides*. Sources: Kryshtofovich (1931), Prokhanov (1933, 1949), Gamajunova (1963), Rechinger & Schiman-Czeika (1964), Nasimova (1983), Nikitin & Geldykhanov (1988), Baikov (1999, 2007), Pahlevani *et al.* (2017), Nasseh *et al.* (2018), www.plantarium.ru, own data. Doubtful records not shown.

the national checklists (Gubanov 1996, Ma & Gilbert 2008). Given the limited presence of the species in southwestern Uzbekistan and its complete absence from Tajikistan and Kyrgyzstan (Shibkova & Kinzikaeva 1981, Lazkov & Sultanova 2014), its presence in China and Mongolia is highly unlikely. This species grows in the mountains on rocky and gravelly slopes from foothills to the upper mountain belt (Nikitin & Geldykhanov 1988).

Euphorbia oidorhiza (syn. *E. balkhanica*) is confined to the Kiçi Balkan (Malyi Balkhan) Mts. in Turkmenistan (Nasimova 1983, Nikitin & Geldykhanov 1988), where it was found on pebble conglomerates (Tarassov 1952b). This species seems to be unique in the group because

Table 1. Diagnostic characters of central Asian species of *Euphorbia* ser. *Andrachnoides*. Leaf characters from the middle part of generative stems. Sources: Prokhanov (1933, 1949), Pojarkova (1951), Tarassov (1952a), Baikov (1999, 2007), and own data.

	E. saurica	*E. irgisensis*	*E. andrachnoides*	*E. undulata*	*E. buhsei*	*E. oidorhiza*	*E. talassica*
Height (cm)	up to 20	up to 25	up to 20	10–20	up to 80	20–25	10–25
Rootstock	slender, spreading	vertical taproot	vertical taproot	vertical taproot	vertical taproot	vertical taproot	slender, spreading
Stems	herbaceous, little branched	herbaceous, rather highly branched	herbaceous, moderately branched	herbaceous, little branched	lignified, highly branched	herbaceous, moderately branched	herbaceous, little branched
Stem pubescence	very short and dense	short and dense	present or absent	absent	present or absent	short and dense	absent
Sterile stems or branches	sterile stems not overtopping inflorescence	sterile stems absent; sterile branches not overtopping inflorescence	sterile stems usually overtopping inflorescence	sterile stems not overtopping inflorescence	sterile stems absent; sterile branches overtopping inflorescence	sterile stems absent; sterile branches not overtopping inflorescence	sterile stems not overtopping inflorescence
Leaf							
length (cm)	up to 2.5	0.8–2.1	0.7–2.2	0.7–2.2	0.7–1.8	1.8–2.5	0.8–2
width (cm)	up to 1.2	0.5–1.5	0.3–1	0.3–0.8	0.3–0.8	0.4–0.7	0.4–0.9
shape (broader part)	elliptic to ovate-elliptic (middle part)	broadly ovate, oblong-lanceolate or obovate (middle part)	ovate-triangular or oblong-ovate (basal part)	oblong, oblong-elliptic (middle part)	narrowly ovate-lanceolate (basal part)	lanceolate or elliptic-lanceolate (basal part)	ovate, obovate, elliptic (middle part)
texture	incrassate	thin	coriaceous	incrassate, undulate	unknown	unknown	incrassate
base	rotund	rotund	profoundly cordate, semiamplexicaul	rotund or broadly cuneate	rotund	cuneate to subrotund	rotund
pubescence	shortly pubescent	shortly pubescent	glabrous or pubescent	glabrous	glabrous or ciliate	glabrous, margin shortly ciliate	mostly glabrous, few hairs at base
Number of pleiochasial branches	8–10	4–6	7–10	3–5	4–5	2–4	4–6
Cyathial glands	appendages crescent-shaped, 2-horned; horns prominent, apically dilatate	appendages crescent-shaped, sometimes cristate, 2-horned; horns prominent or reduced	appendages crescent-shaped, 2-horned; horns short, apically acute	appendages crescent-shaped, indistinctly 2-horned; horns very short or abortive	appendages crescent-shaped, 2-horned; horns short, apically blunt	appendages crescent-shaped, 2-horned; horns very short	appendages crescent-shaped, 2-horned; horns long and thin
Fruit pubescence	shortly pubescent	glabrous	glabrous or ciliate	glabrous	glabrous or ciliate	glabrous	glabrous

of its tuber-like roots; it occurs within the distribution area of *E. buhsei* but readily differs from the latter in its low stature (Pojarkova 1951, Tarassov 1952a).

Euphorbia oidorhiza and *E. balkhanica* were described from specimens collected from the same population, and both names were validly published almost at the same time. According to the imprints on the journal's colophons, the first species name has priority because it was included in a journal's issue dated 13 December 1951, whereas the second species name was published in a journal's issue dated 10 January 1952. This is in agreement with the synonymy first established by Prokhanov (1964).

Euphorbia undulata occurs in steppes and semideserts along the Volga and Don rivers in Russia and Kazakhstan (Kryshtofovich 1931, Prokhanov 1933). This species of short stature is very distinct in the group because of its undulate leaves.

Euphorbia andrachnoides differs from the other species of the series by its ovate leaves with a cordate base, a higher number of pleiochasial branches in a pseudumbel, and sterile stems usually overtopping the inflorescence. It has a rather broad distribution in the Sary-Arqa (Kazakh) Uplands in Kazakhstan, where it grows on various rocky or gravelly substrates at low elevations. This species was considered endemic to Kazakhstan (Gamajunova 1963, Baikov 1999) but was reported by Baikov (2005) from the Aley river in Altay Region of southern Siberia, Russia. The locality in Siberia is rather distantly separated from the main distribution area of the species and should be confirmed because of the deviating morphology of the plants, which were previously referred to *E. subcordata* (Baikov 1999, 2005).

Euphorbia irgisensis occurs in deserts of western Kazakhstan (Nasimova 1983, Baikov 1999) and possibly in the adjacent Uzbekistan (Erejepov 1978). It is a species of low uplands and characterized by oblong leaves that are broader in the middle part, and a vertical taproot.

Euphorbia saurica is a local endemic of eastern Kazakhstan, found in a single locality in the Saýyr (Saur) Mts. (Baikov 1999). It was until now unique in the series because of its slender rootstock; its leaves are similar to those of *E. irgisensis* but the number of pleiochasial branches in a pseudumbel is higher. The locality is situated at ca. 1250 m a.s.l., in a warmer, sunny, less arid climate (Kotukhov 2009).

Euphorbia talassica, described here, is narrowly distributed in the Talas Mountain Range of Kazakhstan and Kyrgyzstan, at 2700 m (in Kyrgyzstan) or 2150–3200 m a.s.l. (in Kazakhstan). So far, it is known from a single locality in Kyrgyzstan (our data) and four localities in Kazakhstan (Prokhanov 1933, as *E. irgisensis* aff.; Karmyscheva 1973, as *E. prokhanovii*; www.plantarium.ru, as *E. tianshanica*). Its distribution may extend to the Syrdaria Qarataý (Syrdarya Karatau) Mts., from which "*E. tianshanica*" was also reported (Gamajunova 1963) but that record was not accepted in a later synopsis (Kamelin 1990). Because of its largely oblong leaves, which are broader at the middle part, this species seems to be most similar to *E. irgisensis* (as assumed by Prokhanov 1933), from which it differs by having a slender rootstock, incrassate leaves, and the occurrence at much higher elevations. Remarkably, the other species that has a similar leaf shape, *E. saurica*, also possesses spreading underground parts but is clearly distinct by a higher number of pleiochasial branches in pseudumbels (8–10 in *E. saurica vs*. 4–6 in *E. talassica*), and also by the presence of pubescence. Among the other species of *E.* ser. *Andrachnoides* in Central Asia, *E. talassica* prefers higher elevations (the other species of high elevations, *E. buhsei*, occurs at 1500–2250 m a.s.l.; Rechinger & Schiman-Czeika 1964).

The flora of arid lowlands and uplands of northern Central Asia is very different from the flora of its mountainous parts; however, there is a certain overlap between the arid and montane fractions of the flora (Kamelin 1973). *Euphorbia saurica* and *E. talassica*, both being narrow endemics in Central Asia (Kamelin 1973), may represent results of local derivations of the arid lowland flora into the mountains. However, their phylogenetic position within *E.* sect. *Esula* should be confirmed.

So far, 28 species of *Euphorbia* are known from Kyrgyzstan with no endemics (Lazkov & Sultanova 2014), whereas 61 species are reported from Kazakhstan (Abdulina 1999), six species of which are endemics or near-endemics

of the country. The species diversity and level of endemism of *Euphorbia* in Kyrgyzstan are the lowest among the central Asian countries (Nasimova 1983) because of the absence of extensive arid lowlands, which harbour many peculiar groups of spurges. The discovery of *E. talassica*, a rare montane element, contributes to the long list of vascular plants endemic to the Talas Range and adjacent mountains and distributed among several plant families (Pavlov 1980).

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